



Introducing.....

By: Marty Hilovsky
PRESIDENT

EnviroScience is pleased to introduce Cortney Marquette, the new director of our MiddFoil® and Lake Management programs. Cortney brings eleven years of experience and education to the EnviroScience team. Prior to assuming her new responsibilities, she had participated in numerous aquatic plant, freshwater mussel, and fish surveys with us.



When asked how she felt about shifting her duties to management of the MiddFoil and Lake Management programs, she replied, "I am excited about the chance to work closely with both agencies' and residents to address the issues facing many freshwater lakes today. I see this as a great opportunity to help communities, make a positive impact on our environment, and grow professionally as a biologist." Though her work finds her in freshwater environments, she says she still loves to escape to the tropics to freedive with the sharks whenever she has the opportunity.

The Verdict is In!

By: Alexis Maple
BIOLOGIST



Eight years after the start of the MiddFoil® process in 1998, EnviroScience has stocked weevils in more than 85 lakes in twelve different states and one Canadian province. With numerous lake associations sitting on the fence waiting to see the results from these stocked lakes - the verdict is in. The MiddFoil® process has proven to be an effective, low maintenance and a very versatile method for controlling the growth of Eurasian watermilfoil

(EWM). In the following paragraphs we answer some frequently asked questions.

Why has the MiddFoil® process been so effective?

First, it's the only long-term technique for controlling EWM. The process simply takes advantage of the predator-prey relationship by tipping the scale in favor of the predator. As with most of these relationships in nature, the population of the EWM and the weevils may fluctuate in the short term, but eventually, both will reach an equilibrium and persist at low levels indefinitely. Secondly, **weevils are very selective, targeting only EWM.** This allows desirable native species to rebound and fill in the voids left behind by dying EWM. A healthy native plant community makes it more difficult for the EWM to re-establish. Third, **the process is environmentally and ecologically sound,** because it uses a beetle native to North America. Finally, **the weevils kill the plant all the way down to the root** so the plant does not return.

How does the MiddFoil® process compare to other methods of controlling Eurasian watermilfoil?

Simply put, weevils are less expensive over a period of several years and they are much more environmental friendly than traditional control methods.

Probably the most common EWM control method used in the U.S. is herbicide application. Of these, the most widely used chemical is 2, 4-D. In use for both agricultural and aquatic use for more than 60 years, 2,4-D is moderately selective and will provide a season of control before re-application is necessary. Another widely used chemical is fluridone. Much more costly and usually applied as a whole-lake treatment, fluridone can provide two and possibly three seasons of control, if properly applied.

Regardless of the type, no herbicide currently available is totally selective for EWM and non-target impacts on native vegetation are inevitable.

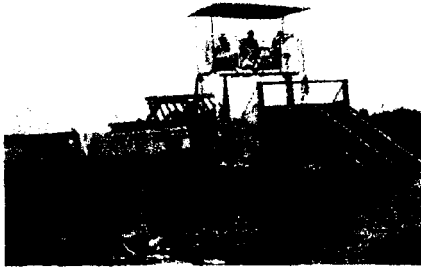
Although herbicides may provide relatively rapid relief, their



effectiveness usually lasts only a year, or two at best, before reapplication is needed.

The next most common conventional control method, mechanical harvesting, also provides fast relief, but can actually help facilitate the spread of milfoil around the lake.

During harvesting, large numbers



of milfoil fragments escape the harvester and float to other parts of the lake where they can root and establish new beds. Hand pulling or raking, another type of mechanical process, can be physically demanding and is therefore suitable for only small areas. Hand control methods may also lead to fragments being spread to un-infested parts of the lake.

According to EnviroScience's president, Martin Hilovsky, "weevils and the MiddFoil® process represent the only permanent solution available for milfoil control. Although lake-wide control by the weevils will take a few years, our clients take satisfaction in knowing that they are implementing an environmentally safe, cost-effective solution that will ultimately return the lake to what it looked like prior to the milfoil infestation."

How do milfoil weevils interact with lake residents and fish populations?

Adult weevils seek out the delicate plant leaves of the milfoil and hide among them. They cling tightly to the plants and are actually hard to remove from the plant, even if shaken fiercely. A content weevil prefers not to leave the plant at all during its entire life cycle.

Weevils, the size of a sesame seed, cannot bite or sting, and are so tiny they are actually difficult to see; difficult for even for a trained expert to locate! In most lakes with a balanced and healthy fishery weevils are generally not worth it as a primary food source due to their small size. As long as the fish population isn't dominated by stunted panfish, fish predation does not seem to be a significant limiting factor for the weevils.

How long will the MiddFoil® process take?

The time frame largely depends on how many beetles are applied to the lake, the size of the lake, and to a lesser extent the density of the EWM. At first glance, a sesame-sized weevil may appear to be an *under*whelming control agent for a lake filled

with EWM. However, they can effect dramatic changes to the plant community of a lake in a period of months when stocked in large numbers. Under most circumstances, it will take several seasons to have its maximum effect. In certain circumstances, EnviroScience can provide integrated past management, which combines the use of the biological control with another treatment, such as harvesting or chemicals. Different parts of the lake can, therefore, be simultaneously managed differently, but this approach takes careful planning and execution. The rate of decline is directly related to the number of milfoil weevils are introduced.

Over the past eight years, scores of lakes in several different states have seen positive results after being stocked with weevils by EnviroScience. With the support of years of university research, numerous journal articles and extensive testing, the MiddFoil® process has been used in both large and small water bodies. Now in 2006, EnviroScience and the milfoil weevils are looking to once again have a very successful year and cross the borders for the second time into Canada.



For more information about the MiddFoil® program, including updated case studies, check out our website at www.envirosceinceinc.com



Milfoil Hybrids

By: Joe Papineau

BIOLOGIST/ GIS ANALYST

While researching milfoil genetics in Wisconsin lakes in 2003, a University of Connecticut graduate student named Michael Moody made a surprising discovery – a strain of milfoil with DNA that did not match any known invasive or native species. The strain discovered by Moody was, in fact, a genetic hybrid of the native Northern Water-milfoil (NWM) and the invasive Eurasian Water-milfoil (EWM) species. Although milfoils reproduce mainly through fragmentation, they can, and do, produce seeds. At some point, NWM and EWM have cross-pollinated and produced hybrid seeds which eventually saw their way to becoming mature plants.

The hybrid milfoil exhibits properties of both of the parents. Combine the "middle-of-the-road" nature of the new strain with the similarities between and variations within the parent species, and you have a plant that is very difficult to identify by any traditional means. The only way to conclusively

demonstrate the presence of the hybrid is through DNA testing.

As testing is revealing the presence of the hybrid in more and more lakes, researchers and agency officials have begun to look at the hybrid's biology and implications in terms of current vegetation management practices more closely.

The Wisconsin Department of Natural Resources (WDNR) has taken the lead in actively seeking out and tracking the hybrid. Funding genetic testing of several Wisconsin lakes, the WDNR has found the hybrid in nearly half of those tested.

Fortunately, the hybrid does not appear to be quite as aggressive as EWM, and it does not form the extremely dense canopies common with EWM infestations. This is an example of some of the positive traits of the native NWM showing through. The presence of NWM traits in the hybrid has a few negative implications as well. Among these is decreased response to herbicides.

Milfoil Weevils and the Hybrid

Studies conducted by University of Minnesota researchers have found that milfoil weevil survival rates on the hybrids are somewhat lower than survival rates seen on EWM, but still above the survival rates seen on NWM, the weevil's native host plant.

What the emergence of the new strain will mean for lake communities and managers is not yet clear. Though there does not seem to be any cause for panic at this time, this relatively new hybrid species of milfoil is something all of us- from academics to applied scientists to lake residents- should be aware and mindful of.

The Verdict is In - Part Two: Paradise Lake, MI: Eight Years and 13,000 Weevils Later

By: Alexis Maple
BIOLOGIST

Paradise Lake (aka: Carp Lake) is a 1,900 acre lake located a few miles south of the Mackinac Straits in northern Michigan. It has an average depth of six feet and a shoreline comprised of an almost equal combination of single-family residences and wetlands.

In 1998, the Paradise Lake Association was one of the very first to contract with EnviroScience for the stocking of 10,000 weevils, with an additional 3,000 weevils being stocked in 1999.



Paradise Lake, also known as Carp Lake, holds an annual Weevil Festival to celebrate the improvement of the lake.

In 2000, EnviroScience profiled Paradise Lake as a weevil success story in the *Weevil Gazette*. The article noted:

In July 1998, three sites were stocked with approximately 3,500 weevils each...by the time of the follow-up survey in September 1998, Eurasian watermilfoil (EWM) biomass had dramatically declined in all stocked areas...the stocking of weevils has been a success both in 1998 and 1999 and will continue to control the EWM problem in the lake for years to come.

During the summer of 2005, EnviroScience biologists re-visited several lakes, including Paradise, to research and determine the long-term status of the MidFoil® program in these early project lakes. At the time of the 2005 Paradise survey, biologists noted a slight resurgence of EWM in small areas of the lake. However, adult weevils were abundant and active in these areas, indicating that the weevils were beginning to control the small resurgence of EWM in the lake. The weevils can be expected to follow a typical predator-prey relationship with the EWM. When EWM (prey) is low and under control, the weevil population (predator) will persist at low levels as well. If however, the EWM increases for any reason, the weevil population will respond and increase in numbers to regain control of the EWM.

Paradise and numerous other lakes treated over the past 8 years are textbook examples of predator-prey relationships, and milfoil continues to be successfully controlled in them. Marilyn Smith, past president of the Paradise Lake Association, continues to update residents about the MidFoil® program. In



Eurasian (left) vs. Northern watermilfoil

the following except from the 2005 Paradise Lake Newsletter, she reminds lake residents of how bad the EWM had become before the introduction of weevils. She notes that the amount of milfoil....

...is far less than in 1997 when the Tipp of the Mitt (Watershed Council) recommended we cut a boating path through the milfoil because at that time it was covering over 1/3rd of the lake.

If you would like to hear more about the MiddFoil® programs at Paradise Lake or another 1998 project at Lake St. Helen, please feel free to contact Marilyn Smith (Paradise Lake) at 231.537.2182 or John Bawol (Lake St. Helen) at jbawol@voyager.net. For additional information about the MiddFoil® program and other references, give us a call at EnviroScience Inc. at 800.940.4025.



EWM Beds stocked in Lake St. Helen between 1998 and 2002

Location of milfoil beds remaining at the end of project in 2002



Weeds in your lake: the good, the bad, the ugly

By: Martin Hilovsky
PRESIDENT/ AQUATIC ECOLOGIST

As the well known saying goes, beauty is in the eye of the beholder. Few of us would consider a lush and abundant patch of aquatic plants beautiful. More commonly, we view these 'weeds' as a nuisance- especially when they grow dense enough to interfere with boating, fishing or swimming

Aquatic plants are critical components of most lake communities and provide many benefits to fish, wildlife, and people. Aquatic plants serve many important functions including:

- **Providing food for fish-** More food for fish is produced in areas having aquatic plants than in

areas without plants. Insect larvae, snails, and a variety of crustaceans inhabit plant beds. Most panfish eat aquatic plants in addition to insects and crustaceans.

- **Providing fish shelter-** Plants provide shelter for young fish and plant beds are areas frequently used for spawning and nesting by bass, sunfish and pike.
- **Improving water clarity and quality-** Aquatic plants help maintain water clarity by stabilizing and preventing the re-suspension of sediment. Moreover, nutrients used by the plants are nutrients that aren't available to algae. This is the old "something will grow" idea. North American temperate lakes tend to be either plant or algae dominated. Which would you prefer if 'something is going to grow'?
- **Providing food and shelter for waterfowl-** Many submerged plants produce seeds and tubers which are eaten by waterfowl. Submerged plants also provide habitat and food for many insects and invertebrates that are, in turn, important foods for resident and migrating waterfowl such as ducks.

It should be pointed out that not all aquatic plants provide equal value to the lake. Domination by one or two species (especially exotic ones) is not a desirable situation. A diverse the plant community provides better habitat and will support a healthier and more diverse fishery. Diversity in these communities is important because they are both critical components of a healthy.

Under the best of circumstances, even native plant communities can become so abundant that they need to be managed. A key objective in any aquatic plant management plan should be to select techniques that provide *selective* control. By minimizing non-target impacts, you can help maintain native plant diversity in your lake and make it harder for exotic and invasive plants to become established.

Give one of the lake management professionals at EnviroScience a call for friendly free advice on ways to maximize native plant diversity in your lake.

How many 'Non-Native' species are in or around your lake?

By: Cortney Marquette
BIOLOGIST/ PROJECT MANAGER

They may not be something you think about on a regular basis, but exotic species are something we should all be aware of due to the ongoing threat they pose to our freshwater resources.

You've heard the terms- 'Non-Native', 'Non-Indigenous', 'Exotic'. By definition, non-native species are those that arrived since the time of European contact, hundreds of years ago. So, some of the plants, fish and bugs that you've seen your whole life, really shouldn't be here. Some examples of these are Phragmites, purple loosestrife, Eurasian watermilfoil, carp, round goby and sea lamprey just to name a few. One in particular worth noting is the infamous zebra mussel.

First found in 1990 in Wisconsin waters in Lake Michigan. It's believed that this small filter feeder, bivalve nuisances were brought to North America as larvae by ballast waters from ships that traveled from Eurasian ports to the Great Lakes. This non-native species of mollusks has developed quite the reputation for being invasive. As the following figures show, zebra mussels were widely scattered throughout the Great Lakes in 1990. Fifteen years later, zebra mussels can be found in more than 20 states ranging from Vermont to Louisiana.

How did they move so fast? Each zebra mussel spawns anywhere from 40,000 to 60,000 eggs a year!! These microscopic plankton float around until they find a secure place to attach (like your boat!).



Each year, zebra mussels cause millions of dollars of expense to power plants and other industrial facilities, along with cooling systems of boat engines. In addition, they feed on phytoplankton, the main staple of food for life in lakes and rivers.

How can you help check the spread of these invaders?

- Start by checking objects that have been left in the water in your lake/reservoir over a period of time- such as boats, docks/ramps and buoys.
- Inspect your boat and inform others to do so.
- Don't transport your boat from waters known to be infested with zebra mussels without proper cleaning of the boat, equipment and trailer.

Did you know... EnviroScience can help you deal with these types of issues? If you'd like more information about the lake management services at ES, check out the website at www.enviroscienceinc.com or call Cortney at 800-940-4025.

Speaking of Nasty Invasives.....

By: Cortney Marquette
BIOLOGIST/ PROJECT MANAGER

The next major threat to Midwestern lakes is on the march and it's not too early to begin monitoring for it. **Hydrilla** is a particularly noxious aquatic plant from Southeast Asia that first took hold in Florida in the 1950s. In the early 1990's a cold-tolerant variety showed up in Connecticut and has been on the move ever since!

The plant resembles native

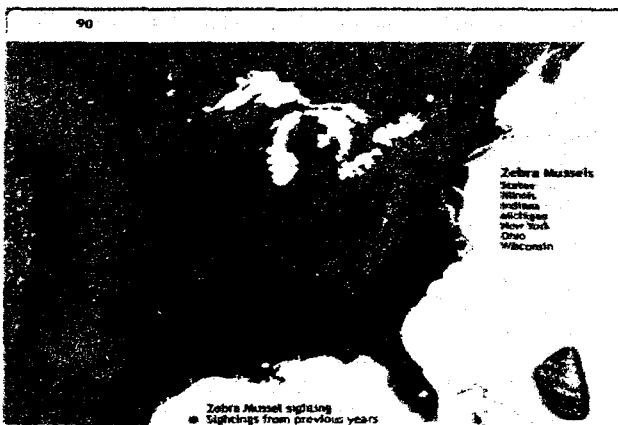


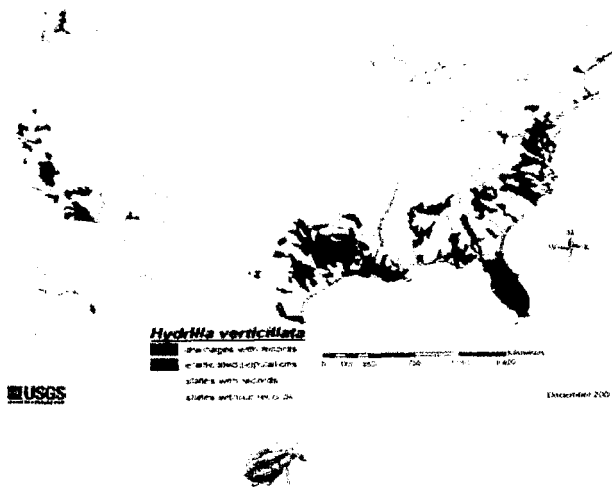
Figure 1- ZM Distribution in 1990



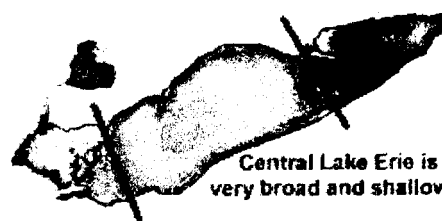
Figure 2 - ZM Distribution as of 2005

Elodea, but this exotic is much more aggressive, growing up to one inch per day! It produces extremely dense monocultures that can out-compete even Eurasian watermilfoil and take over a lake in a very few years.

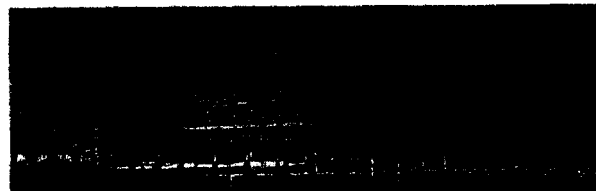
Although not yet recorded in their states, the Wisconsin and Michigan Departments of Natural Resources are so concerned about this threat that they have established strike teams to provide rapid response to reported infestations of the plant.



many nutrients (especially phosphorus) from human activities are also a major factor. As with smaller lakes, too much phosphorus promotes algal blooms. When the algae settles to the bottom and decays, it uses up the oxygen.



During this past summer a group of researchers from the Ohio State University's Stone Laboratory on Gibraltar Island investigated the frequency and duration of low oxygen concentration in an area that is called the Sandusky Sub-basin. This phenomenon has become known as the 'mini' dead zone and it consists of a smaller area east of Kelley's Island to Lorain Ohio. This work was supported by the Ohio Lake Erie protection fund, Ohio Sea Grant, and research endowments from Stone Laboratory.



Stone Laboratory on Gibraltar Island

OSU finds a second 'Mini' Dead Zone in Lake Erie

Submitted by: Matt Thomas - Ohio State University Stone Laboratory



Lake Erie's Dead Zones

The well-known phenomenon of a dead zone in Lake Erie's central basin stems all the way back to the 1950's when huge numbers of annually emerging mayflies began to dwindle, and researchers started paying closer attention to what was happening in the lake. They found that bottom waters were becoming anoxic (without oxygen) during summer months and this can last for days or months. The dead zone is located in the Lake's central basin between Lorain, Ohio and Erie, Pennsylvania.

The configuration of the Central Basin of Lake Erie is partly responsible for the problem, but too

On cruises aboard Stone Laboratory's research vessel, the *R/V Erie Monitor*, 11 stations were sampled throughout the Sandusky sub-basin and where monitored from June 10th-August 12th. They discovered that nearly the entire bottom of the sub-basin deeper than 40 feet was anoxic (less than 2ppm) by mid July.

This mini dead zone remained nearly devoid of oxygen until late August when a combination of cooler temperatures and wind allowed the bottom waters to mix with the surface waters, replenishing oxygen concentrations throughout the entire water column.

So how does the mini dead zone affect the organisms living at the bottom of the Sandusky sub-basin? Certainly most invertebrate animals (such as *Hexagenid* mayflies) living at the bottom would not be able to tolerate low levels of oxygen. Potentially more important to humans is the effect of the mini dead zone on fish populations that migrate through these areas or stay near the bottom. These would include important sport fish such as walleye, yellow perch, and sturgeon. These species would most likely avoid these areas of low oxygen.

While existence of the dead zone in the Sandusky sub-basin was previously known, the intensity and duration were not. Its presence can have many detrimental effects, but further research into how it forms and how it affects organisms in the lake including commercially valuable game fish needs to be further studied.

For more information about the dead zone in Lake Erie, check the USEPA website at www.epa.gov.

MiddFoil® goes International!

By: Marty Hilovsky
PRESIDENT



In addition to the 12 states we are currently approved in, EnviroScience and its Canadian partner **Biofilia** (www.biofilia.com) begun a three year stocking program in **Lac Supérieur**, Quebec during July, 2005. Sponsored by the Municipality of Lac Supérieur and the Lac Supérieur Association, the program involves stocking approximately 10,000 weevils per year in four locations.

Obtaining the necessary approvals and permits from federal and provincial authorities took more than two years of hard work by Biofilia and the Municipality, and involved the cooperation of the Canadian Food Inspection Agency, Oceans and Environment Canada-Quebec Region, the Quebec Ministry for Parks and the Environment and the Quebec Ministry for Natural Resources and Fauna. A significant requirement of these agencies prior to granting approval was the ability to demonstrate that the milfoil weevil is native to Quebec and Lac Supérieur. In 2004 a team of EnviroScience biologists traveled to the site and was able to conclusively demonstrate that weevils are present in the lake.

The first follow-up survey was completed in early September and the results indicate that the weevils are reproducing and off to a good start. A description of Lac Supérieur and the weevil project can be found at the Lac Supérieur web site (www.learmideslacsuperieur.com).

In 2006 EnviroScience expects to begin its first Ontario project at Puslinch Lake near Guelph, Ontario. We hope to secure the required Provincial approvals by late spring and begin stocking in June.

Ask the Bug Guy



Q: Mr. Bug Guy, how do weevils find the milfoil in our lake?

A: As you might guess, there's not a lot of room for brains in an insect no bigger than a sesame seed. Despite this, these little critters are remarkably successful at locating beds of milfoil when returning from shore in the spring. A recent report out of the University of Minnesota sheds some light on how they do this!

In the December 2005 Journal of Chemical Ecology, Michelle Marko, Ray Newman, and Florence Gleason reported that milfoil weevils are attracted by two chemicals released by Eurasian watermilfoil. These two common chemicals, uracil and glycerol, are released in much higher concentrations by Eurasian watermilfoil than by either the native Northern watermilfoil or the Eurasian-Northern watermilfoil hybrid. Weevils are good at detecting these two chemicals and appear to use them as a chemical trail to lead them to their food source. This is the first reported example of an aquatic insect specialist being attracted by chemicals released from its host plant.

Saying farewell to the many friends of the MiddFoil® program.

By: Alexis Maple
BIOLOGIST

The MiddFoil® program has been my home for the past four years, and for the last couple I've led the field operations group. I'm sad to announce that I have recently accepted a new position at EnviroScience. I'm joining the Ecological Services Division of EnviroScience Inc. to participate in a new project involving monitoring adult and larval fish populations. Although I am excited about this opportunity, I will miss the many friends I've made during my field days with the MiddFoil® group.

I sincerely appreciate the friendliness and unwavering hospitality shown to me by our clients during my years with the Lake Management Division and the MiddFoil® program.



In this issue of the Weevil Gazette:

- **The verdict is in after the 8th year of the MiddFoil[®] Program!**
- **Milfoil hybrids**
- **MiddFoil[®] goes international!**
- **Invasive species in your lake**
- **Lake Erie's dead zones**



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**Here is your copy
of the 2006
Weevil Gazette!**

Win one of our adorable Weevil Beanies!

Put on your thinking cap and figure out how many words can be made from the letters of the following words:

Euhrychiopsis lecontei

The top ten finishers will each receive one of our weevil beanies. Please submit your entry via either email (cmarquette@enviroscienceinc.com) or by regular mail to:

**C. Marquette
EnviroScience Inc.
3781 Darrow Road
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